Time-resolved, high-speed, low-level light imaging for homeland security applications

V. Dangendorf[§], A. Breskin*, O. Jagutzki[€], M. Riches[£], D. Vartsky[x]

[§] Physikalisch-Technische Bundesanstalt, Braunschweig, Germany
* Weizmann Institute of Science, Rehovot, Israel
[€] RoentDek Handels-GmbH, Kelkheim, Germany
[£] Invisible Vision Ltd, Norwich, United Kingdom
[x] Soreq NRC, Yavne, Israel

In recent years, significant progress in fast-neutron based interrogation techniques for air luggage and palletized cargo has been achieved by introducing a new method of multi-frame high speed imaging, that incorporates ultra-fast exposure timing on the nansosecond time scale. This development is based on modified (but, in principle, commercially available) high-speed camera systems with segmented, independently gateable image intensifiers and a novel, very fast optical booster in front of an image splitter. The booster provides sufficient light even from very faint light sources such as ultra-fast plastic and liquid scintillators for the high-speed camera system.
The method will be presented, as well as our application to fast-neutron resonance imaging for aviation security purposes. Additional applications in gamma- and x-ray imaging, as well as radiation spectroscopy and imaging in high-power laser radiation sources, will be presented.

Following the presentation of the above **integrating** neutron detection method, we shall also discuss an alternative method for fast-neutron resonance imaging, based on arrays of **pulse-counting** position sensitive image intensifiers. Commercial manufacture of these detectors has recently commenced. These optical sensors are presented and further applications are discussed.